

2022 SCE RAMP (A.22-05-013) Post-SPD Staff Evaluation Report Workshop

November 29, 2022



California Public
Utilities Commission

Agenda and Schedule	Time
Introduction	9:00 - 9:05
High Level findings	9:05 to 9:20
Wildfire and PSPS risks	9:20 to 10:45
Break	10:45 to 10:50
Contact with Energized Equipment risk	10:50 to 11:00
Underground Equipment Failure risk	10:50 to 11:00
Physical Security risk	11:00 to 11:20
Cyber Security risk	11:00 to 11:20
Seismic risk	11:20 to 11:30
Hydro Dam Failure risk	11:20 to 11:30
Lunch	11:30 to 1:00
General Q and A	1:00 to 3:00

2022 SCE RAMP Evaluation

- Objective: SPD is required by the Commission to review Risk Assessment and Mitigation Phase (RAMP) applications. SPD completed evaluation of 2022 SCE RAMP in A.22-05-013.
- The 2022 SCE RAMP is the first SCE RAMP in which SCE is bound by the terms of the Safety Model Assessment Phase (S-MAP) proceeding's Settlement Agreement in D.19-04-020.
- Approach:
 1. Determine compliance with the S-MAP Settlement Agreement, requirements in D.14-12-025, D.16-08-018, and D.21-11-009, and other elements described in the Scoping Ruling.
 2. Determine areas of utility risk management deficiencies in the 2022 SCE RAMP.

SPD's Overall Critical Findings

1. Missing Risk Spend Efficiency (RSE) calculations for compliance-related mitigation activities.
2. An unjustified 10% discount rate applied to incremental mitigation costs when calculating RSEs.
3. High implied Value of Statistical Life (VSL).
4. Lack of detail or explanation for the pace or extent of selected mitigations.
5. Lack of transparency related to models using machine learning techniques.
6. Oversimplified risk bowties.
7. Overly granular presentation of risk analysis.

Wildfire Risks

Wendy al-Mukdad, Senior Utilities Engineer, and Edwin Schmitt,
Regulatory Analyst

SPD's Critical Findings for Wildfire Risks

1. Overly granular presentation of risk analyses.
2. Low cost-efficiency of wildfire covered conductor (WCCP) and targeted undergrounding (TUG) mitigation programs.
3. Lacking justification for the late addition of TUG circuit segments.
4. Routine vegetation management lacks risk modeling.
5. Not all risk factors, such as egress, included in RSE calculations.
6. Wind dependency is missing in SCE's ignition models.
7. Catastrophic losses are inadequately modeled.
8. Risk model does not include the health and safety consequences of wildfire smoke.
9. The risk reduction from the covered conductor mitigation program is likely under-valued in the risk modeling.

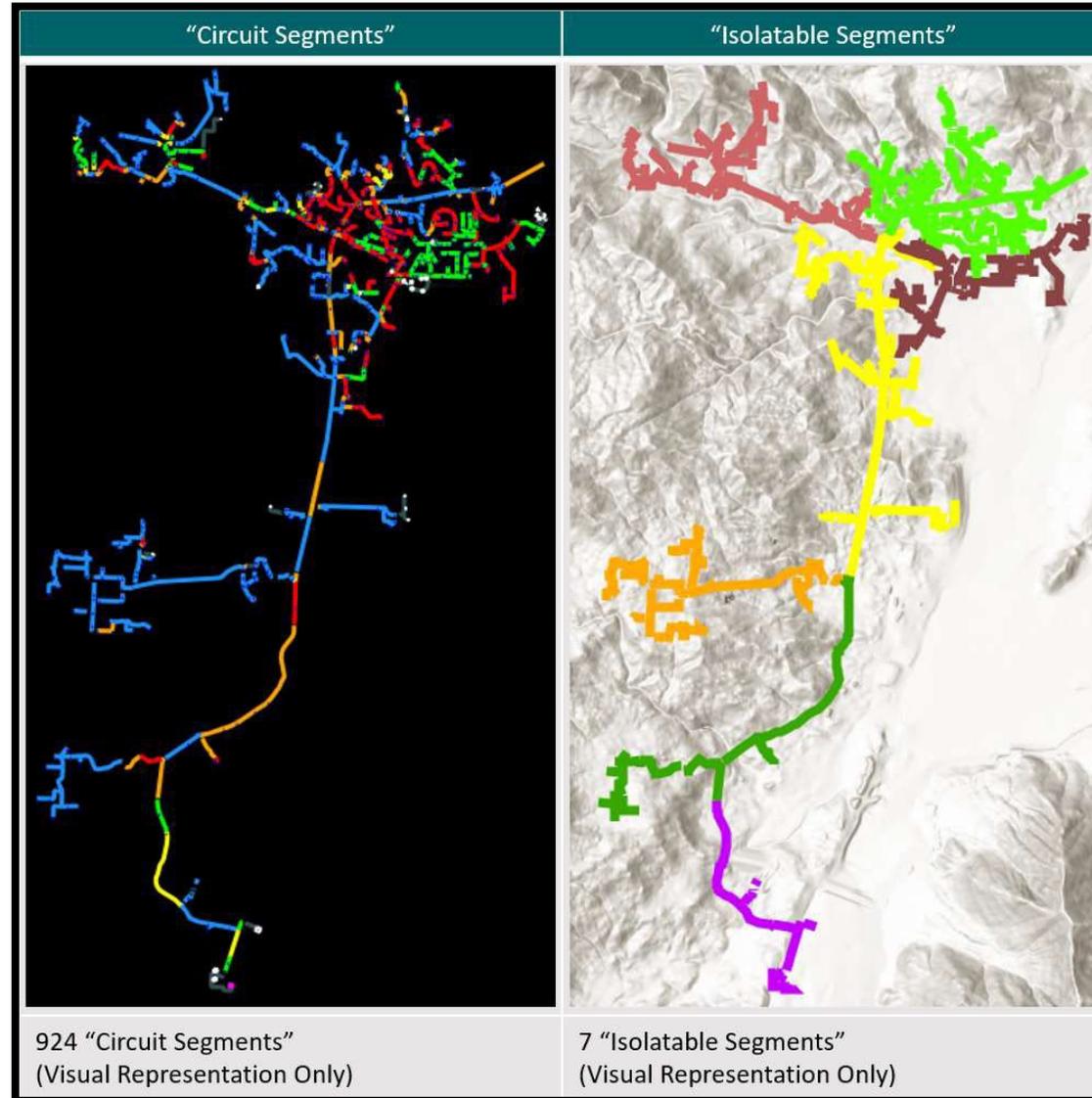
Tranches

- SCE established two distinct means of creating tranches:
 - Three broad tranches that correspond to three HFRA; and
 - Granular tranches for each circuit segment on their network.
- HFRA scale reporting tranches – T1 Severe Risk Areas, T2 High Consequence Areas, and T3 Other HFRA
 - SCE decoupled its actual mitigation planning from its risk scores (MGRA)
 - SCE's risk score constitutes only one component of its Severe Risk Area designation, and only as a threshold value at that.
 - The additional risk factors that SCE lists (i.e. egress, burn history, extreme winds, and PSPS) are important and should be part of SCE's risk model as well.
 - Adding these variables afterward in an ad-hoc, opaque process precludes effective evaluation of SCE's risk prioritization model.

Granularity of Tranches

- SCE uses the Wildfire Risk Reduction Model (WRRM) to classify every circuit segment as a tranche and performs fire simulations at this highly granular level.
 - Results in very small tranches that are, in some cases, measured in inches.
 - Mean segment lengths are less than 400 feet for TUG and WCCP.
- SCE defined circuit segment tranches so granularly that they cannot be chosen in isolation for proposed Targeted Undergrounding Program (TUG) or Wildfire Covered Conductor Program (WCCP) mitigations.
 - If SCE still wants to use a granular risk modeling approach at the circuit segment scale, then the granular data should be transparently aggregated into project-sized isolatable segments to understand the risk reduction potential of a realistic tranche so that the mitigation plan can consider trade-offs between tranches on the RSE of each tranche.

Visual Model of Circuit Segments and Isolatable Segments



RSE by Reporting Tranche

- SCE’s RSE calculations indicate that the proposed mitigations will decrease total risk scores 21% for Severe Risk Areas, 16% for High Consequence Areas; and 7% for Other High Fire Risk Areas.
- The 2025-2028 costs to achieve these results are detailed in Table 3; here are a few examples:

ID	2022 RAMP Control Name	Cost Estimate	2025 Risk Spend Efficiencies		
			T1 RSE	T2 RSE	T3 RSE
M1	Targeted Undergrounding	\$3,098,420,000	323	88	39
C1	Wildfire Covered Conductor Program	\$751,437,000	1,565	2,021	628
C2	Branch Line (Fuses)	\$6,074,000	4,265	3,304	3,575
C3	Remote-Controlled Automatic Reclosers	\$15,832,000	4,207	7,147	2,920

- SCE cautions against directly comparing RSEs between controls and mitigations, especially between different categories of work (i.e., system hardening vs. inspections).

RSE Analysis and Comparison

- WCCP exhibited much higher RSEs than TUG
- SCE argued that TUG provides higher level risk reduction than WCCP
- Noticed high levels of variation
- Not amenable to grouping in only three tranches
- Explored a sub-sample using the 67th percentile of risk reduction

TUG & WCCP Circuit Segments		
Variable	Undergrounding (TUG)	Covered Conductor (WCCP)
# Segments	7989	16745
RSE Mean	2279.58	8677.85
RSE Standard Deviation	13952.72	44064.58
Risk Reduction (RR) Mean	0.000416	0.000267
RR 67th Percentile	0.000339	0.000195
RR Standard Deviation	0.000795	0.000618

Low Cost Efficiency of WCCP & TUG Mitigations

- SPD's analysis of RSE for the WCCP and TUG proposals determined that 40% of spending in these programs will account for approx. 85% of the total risk reduction from these two programs.
- SCE's most expensive programs to address wildfire risks are its WCCP and TUG programs.
- SPD is skeptical that the \$3B TUG is cost-effective, especially at the proposed scale, after the massive Covered Conductor (CC) program has been underway to mitigate higher-risk areas for years.
- Other than TUG, proposed pilot mitigations have high RSEs, and while DRs have clarified some issues, there are still many challenges as to whether they will be ready for wide-scale deployment starting 2025.

Error in TUG Mileage Scope

- SPD found duplicate miles in multiple deployment years which caused SCE to discover an RSE coding error. SCE remedied the coding error and added in 173.4 circuit miles (30%) of new circuit segments as part of the proposed 580 TUG circuit miles.
 - Due to required rerouting, SCE estimates that 685 circuit miles will be undergrounded to replace the 580 circuit miles of overhead lines.
- SPD finds adding these new circuit segments is questionable and recommends they be removed.

Compliance & Control RSEs

- SCE does not provide risk modeling for the routine vegetation management compliance control program.
- RSEs for controls are required by D.21-11-009 and without risk modeling staff cannot tell how these routine activities would interact with other risk mitigation efforts.
- Control RSEs: Branch Line Fuses (BLFs) and Remote Automatic Reclosers (RARs) have high RSEs, but at present they have limited scope.

Alternative Wildfire Mitigation Plans

- The Proposed Plan focuses on TUG in the Severe Risk Areas and WCCP in the High Consequence Risk Areas.
- In contrast, the overall focus of WCCP in Alternative Plan #1 may be a more cost-effective alternative to the scale of targeted undergrounding that SCE is proposing in their Proposed Plan.
- Alternative Plan #2 assumes lower risk within the High Consequence Risk Areas and therefore removes all of the WCCP from this plan but retains the TUG mitigations in the Severe Risk Areas.
- SPD recommends that SCE consider a third alternative.
 - Utilize 67th percentile for TUG & WCCP proposals based on risk reduction.

SPD concurs with TURN & MGRA on Deficiencies:

- SCE has not included all risk factors in its RSE calcs including egress. (TURN)
- Wind dependency is missing in SCE's ignition models. (MGRA)
- Catastrophic losses are not adequately modelled. (MGRA)
- SCE's heavy reliance on Technosylva's consequence modelling has limitations due to premature termination of fire growth. (MGRA)
- SCE's risk model does not capture correlations between risk drivers that increase outage rates and the "extreme weather" periods it uses for its consequence modeling. (MGRA)
- SCE risk model does not include the health & safety consequences of wildfire smoke. (MGRA)
- Based on SCE's recent fault data, there is a high likelihood that SCE's CC mitigation is more effective than SCE gives it credit in its risk modeling. (MGRA)

SPD Recommendations for Wildfire Risks

1. SCE should revise its risk modeling to:
 - a. Include all risk element factors, such as egress, into the risk reduction and RSE calculations.
 - b. Include the missing wind dependency in SCE's ignition models.
 - c. Improve modeling of catastrophic losses and the impacts of longer-lasting fires.
 - d. Better reflect consequences of increased outage rates and "extreme weather" periods (i.e. add a RFW day variable).
 - e. Include estimates of health and safety consequences of wildfire smoke.
 - f. Reflect the more accurate risk reduction from Covered Conductor based on SCE's fault and wire-down data.

SPD Recommendations for Wildfire Risks

2. SCE should utilize isolatable circuit segments for tranches to align more closely w/ how projects would be implemented on the ground.
3. Remove the additional 173.4 circuit miles (30%) in the most recent proposed TUG, as SCE included these to replace duplicated circuit miles without adequate justification.
4. Additional tranche classifications should focus on using combinations of quintiles of LoRE and CoRE, so that the isolatable circuit segments with the highest 20% of LoRE and the highest 20% of CoRE would be grouped together for more logical RSE calculations.

SPD Recommendations for Wildfire Risks

5. Risk modeling should be conducted for Routine Vegetation Mgt even though it is a compliance-related risk mitigation activity.
6. SCE should consider expanding both Branch Line Fuses (BLF) and Remote Automatic Reclosers (RAR) due to the high RSEs associated with these technologies.

Public Safety Power Shutoff (PSPS) Risks

Edwin Schmitt, Regulatory Analyst

SPD Critical Findings for PSPS Risks

1. PSPS damage events not included in ignition risk model.
2. Granular tranches do not clearly explain the risk of PSPS to vulnerable customers.
3. Improper designation of activities as Foundational.
4. Lack of details regarding how Fast Curve de-energizations impact vulnerable customers.

SPD Recommendations for PSPS Risks

1. SCE should integrate PSPS damage and hazard reports into their likelihood calculations
2. SCE should consider creating tranches to reflect impacts to different types of customers affected by PSPS Risk Events.
3. SCE could consider recognizing risk reduction that comes from educating vulnerable populations about the risk of PSPS events rather than designating these activities as Foundational.
4. SCE should provide details regarding how they address the impact of a Fast Curve de-energization on AFN and MBL customers.

Contact with Energized Equipment (CEE) Risks

Hafizur Chowdhury, Senior Utilities Engineer

SPD Critical Findings for CEE Risks

1. For the year 2025, staff assessed the SCE input data and identified that C1 and C2 RSEs differ from those presented in Chapter 5.

SPD Recommendations for CEE Risks

1. SCE should present updated information about the mitigations M2-M5, not in a pilot study phase, in the GRC filing.

Underground Equipment Failure (UEF) Risks

Hafizur Chowdhury, Senior Utilities Engineer

SPD Critical Findings for UEF Risks

1. Oversimplified risk bowtie with insufficient details on risk drivers.
2. Input data on RSEs not transparently explained.
3. Slow pace of BURD transformer replacement may be inadequate to sufficiently reduce risk from BURD transformer failures.

SPD Recommendations for UEF Risks

1. SCE should consider adding an extra column for “sub-drivers” in the risk bowtie to characterize the true factors, threats, or mechanisms contributing to UEFs in that tranche or that subcategory of exposure.
2. SCE’s proposed BURD transformer replacement rate is likely to be insufficient, therefore, SPD recommends SCE re-examine the pace of the BURD transformer replacement program.

Cyber Attack (Cyber-security) Risk

SCE RAMP Chapter 7

Jeremy Battis, Senior Regulatory Analyst

SPD Critical Findings for Cyber-security Risk

1. Risk bowtie model insufficiently explains how the potential risk event could be brought to bear, and seems to equate subcategories of exposure (i.e., insider threat, supply chain procurement malware) with risk drivers; this has the effect of misidentifying a given trigger event.
2. As with its 2018 RAMP filing, SCE's 2022 Cyber-security risk RAMP chapter provides a disclaimer noting that Edison's analysis does not speak to resulting significant secondary impacts involving a Cyber-attack up to and including a sustained territory-wide blackout.
3. As with other RAMP risks, SCE omitted RSE values for Controls, and cut useful descriptive discussion included within its 2018 RAMP for this risk category, including that pertaining to Federal compliance obligations.

SPD Critical Findings for Cyber-security Risk

(Cont.)

4. SCE does not adequately explain or justify why the utility proposes a four-year mitigation (risk containment) plan that totals \$531.2 million, or about \$132.8 million per year to continue five existing Risk Controls
5. Edison's proposed spending amount represents a sizeable increase over prior spending levels for this risk category, with a total 2018 RAMP budget of just \$477.4 million covering a six-year period, amounting to a past annual spend of only \$79.6 million.
6. Overhead cost (O&M) for this risk appears to be on the high end, at 26 percent of Cyber-security program spending.

SPD Recommendations for Cyber-security Risk

1. SCE should be demonstrating increased capacity and competency with each RAMP iteration; yet Edison's 2022 RAMP provides less useful information than was included within its 2018 RAMP effort for this risk category.
2. As such, SCE should consider, at minimum, providing the level of detail as was included in the 2018 RAMP for items such as RSE and Controls.
3. SCE should strive to grow its capacity for modeling and quantifying all adverse cumulative impacts resulting from this risk should it be brought to bear; and Edison should aim to disclose the risk and cost of any resulting total blackout from Cyber Attack within its next RAMP iteration.

SPD Recommendations for Cyber-security Risk

(Cont.)

4. SCE should attempt to quantify worst-case scenarios and secondary impacts developed via their risk modeling and by way of risk-event simulations performed with Gridex.
5. SCE should give additional consideration to its Bowtie model for this risk to better identify a more accurate and representational set of causation factors to serve as improved Risk Drivers.
6. SCE should better substantiate the need for any increased spending to address this risk and should better illuminate the programs that comprise the utility's efforts to mitigate this risk.

Physical Security Risk

SCE RAMP Chapter 11

Jeremy Battis, Senior Regulatory Analyst

SPD Critical Findings for Physical Security Risk

1. Edison's identified Tranche categories for this RAMP risk chapter -- Protection of Grid Operations Transmission System, Protection of Major Business Functions, and Protection of Generation Capabilities - - are generally interchangeable with the utility's identified Risk Controls, which seems inadvisable.
2. Accordingly, a single risk Tranche -- Grid Operations -- accounts for 85 percent of the overall risk.
3. RSEs could be better presented so as to be more useful. Notably, SCE provides no RSE calculations for its risk chapter and provides little insight into how its limited treatment of RSE was derived.

SPD Critical Findings for Physical Security Risk (Cont.)

1. The only hard numbers SCE provides to speak to RSEs include a single column within the spending table for each mitigation plan showing the RSE assigned to individual control measures.
2. For its proposed plan, SCE provides RSE numbers for component parts having 2023 RSE values ranging wildly from 0.1 to 189.7; SCE provides no overall RSE value for any of the three risk mitigation plans it describes.
3. SCE's CM category of controls consists of regulatorily-required controls. As was the case for other risk chapters, SCE did not provide an analysis or RSE calculations for its CM controls.

SPD Recommendations for Physical Security Risk

1. SCE should improve its methodology for this risk category by re-thinking its approach to assigning risk Tranches, using more granular categories that account for similar shares of the overall identified risk values.
2. SCE should clearly disclose and demonstrate its RSE calculations for its risk chapter and how those values were derived.
3. SCE's various mitigation plan alternatives should provide RSE numbers both for individual risk controls and mitigation measures as well as for the entirety of each plan alternative.

SPD Recommendations for Physical Security Risk (Cont.)

4. SCE should fully illuminate its CM category of controls and provide costs, RSEs, and the like.
5. SCE should thoroughly explain its CM category of controls including distinguishing how these programs are or are not funded by ratepayer dollars overseen by the Commission.

Seismic Risk

Chirag "CJ" Patel, Senior Utilities Engineer

SPD Critical Findings for Seismic Risks

1. Staff notes it is not clear if there are distinct differences between Tranche 1 and 2 other than different Criticality of Asset indexes; both tranches have critical assets. Therefore, Tranches 1 and 2 do not appear to have different homogenous profiles.
2. It is unclear why Tranche 4 is not included in the RAMP analysis but is a part of SCE's Seismic Resiliency Program. Tranche 4 is composed of other critical facilities including but not limited to transmission corridors, lattice towers, and other major facilities.
3. SCE has identified two alternatives which both will reduce risk at a slower pace by decreasing the amount of money spent on mitigation activities. Alternative 1 is to reduce the current scope from \$44M/yr to \$25M/yr and Alternative 2 is to reduce the current scope from \$44M/yr to \$15M/yr.

SPD Recommendations for Seismic Risks

1. Staff recommends proposing programmatic alternatives in future RAMP filings such as different mitigation programs.

Hydro Dam Failure Risk

Chirag "CJ" Patel, Senior Utilities Engineer

SPD Critical Findings for Hydro Dam Failure Risks

1. Staff notes it is unclear why C2 – Dam Surface Protection and C5 – Seepage Mitigation are separate as they do not appear to have different homogenous risk profiles.

SPD Recommendations for Hydro Dam Failure Risks

1. Staff suggests SCE consider consolidating C2 – Dam Surface Protection and C5 – Seepage Mitigation.

Questions?

